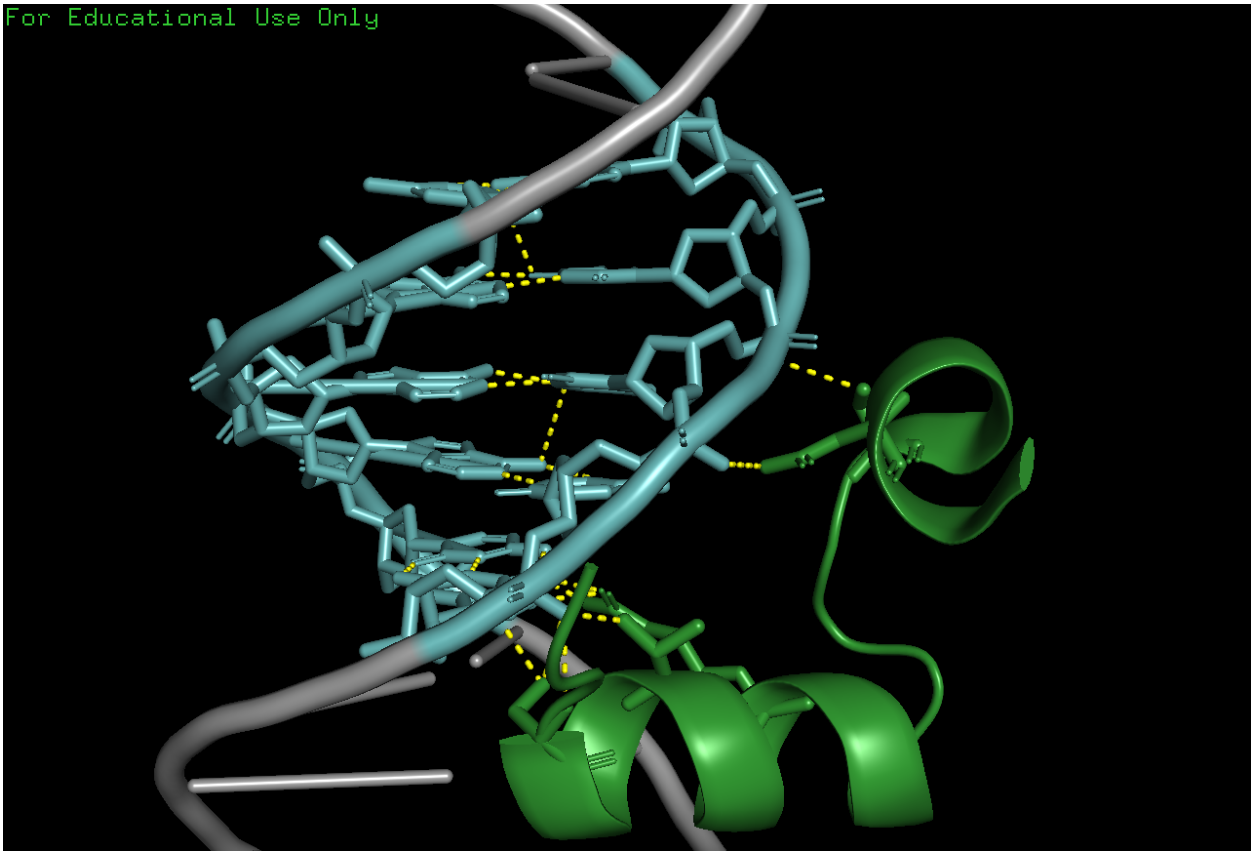
Shane Abbley

Molecular Visualization Assignment

Part 1 - Oct-4 with DNA substrate



The five ‘ATTTG’ nucleotides above (teal) form hydrogen bonds on both sides. On one side, they hydrogen bond with their corresponding nucleotides in the typical Watson-crick base pairs and on the other they hydrogen bond to the active site amino acids in the Oct-4 transcription factor. This second hydrogen bond comes from the sugar backbone rather than the pyrimidine or the purine.

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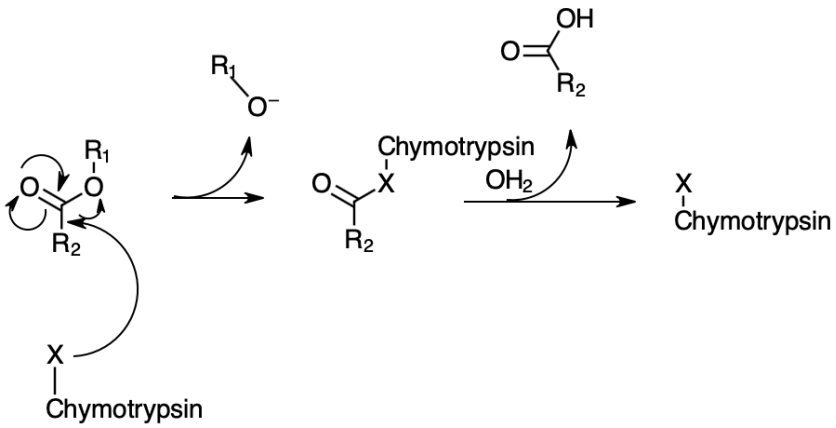
Part 2 - Chymotrypsin with active site and substrate



The key chemical event of the chymotrypsin reaction occurs in two steps: the first being an acylation, followed by a deacylation. This is a ping-pong type mechanism that results in a carboxylic acid and the original chymotrypsin molecule.

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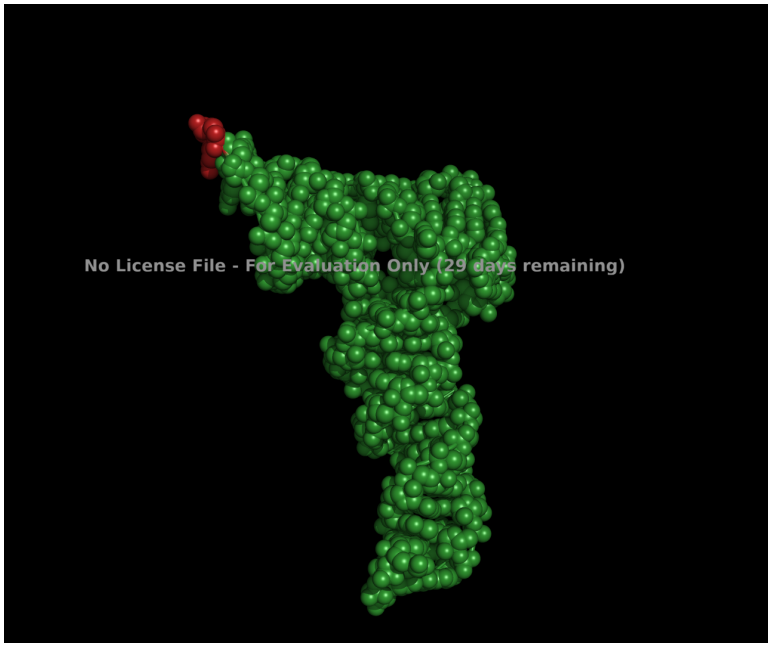
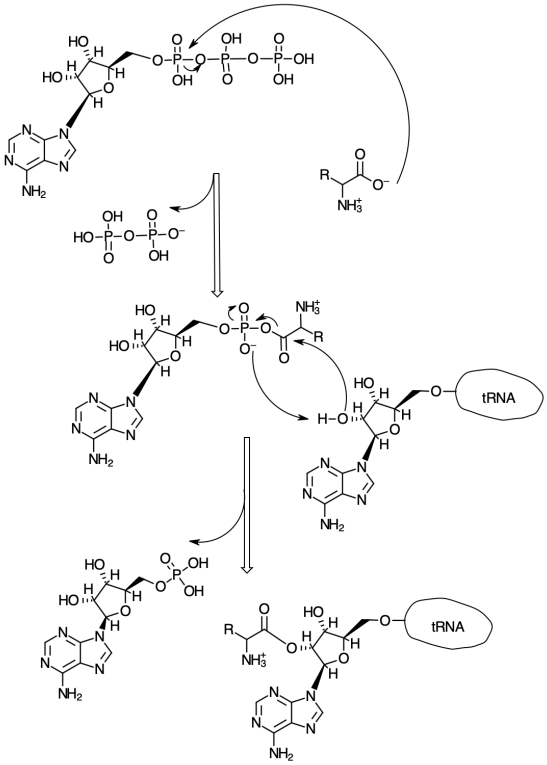
Part 3 - tRNA synthetase mechanism and visualization



The key chemical event in the tRNA synthetase reaction is the transfer of one amino acid to the tRNA. This occurs in two steps and uses one ATP and produces one AMP and a diphosphate.



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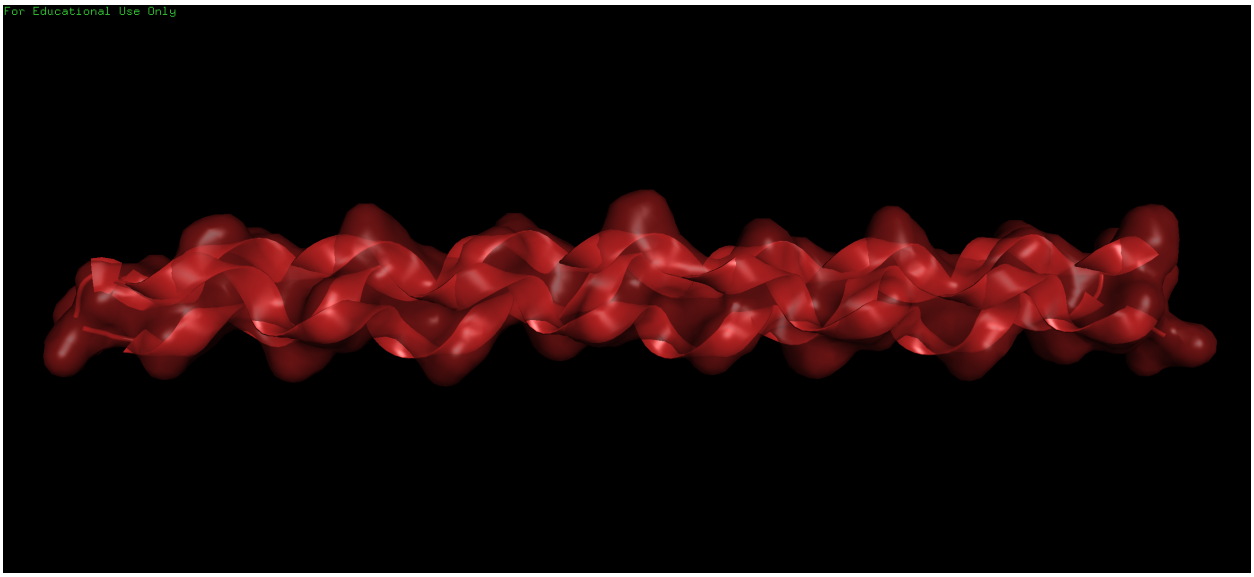
Part 4 - Collagen chit-chat



Hey y'all nice to meet you. The name is collagen, I am the one who is helping you right now. Helping you eat those snacks that you are munching on… (various minerals are crystallized in me in your teeth) helping you sit up nice and straight with those nice broad shoulders of yours… (I lay in a criss cross pattern and provide support for most of your cells) I mean come on… I am keeping everything in your body where it currently is. Isn't that something? I connect your muscles to your bones and other muscles with my triple helix structure. Well not really just me, but all of us. We usually go by A, B, and C. We work together in a coil, so that our strength is multiplied. That is, by doing this, we increase our strength against torsional and tensional forces, think of the individual threads composing a rope. When things get heated we usually denature and take some time for ourselves. We don't always come back together the same, we usually come back in a squishy mesh you might know as gelatin. But don't let that disturb you, we get along pretty well because we have so much in common. For the most part, we all contain a repeated structure of three amino acids. First, is glycine which has a small side chain allowing for sharper angles in our chains than those seen in other proteins. The next amino acid is proline, which makes up for the loose structure that glycine would usually provide by creating a rigid kink in the secondary structure. This is complemented by the last amino acid hydroxyproline, which is created with

the help of vitamin C[1]. Without enough vitamin C you get scurvy, but I know you eat your veggies because if you did not, then I would not be in great shape. You would be feeling pretty bad too, especially the strength your teeth and your ability to recover from an injury. We come in various tertiary and quaternary structures and are the most prevalent of all proteins in the body. Anyways I gotta go fix that ankle you sprained last week… be more careful next time would ya?

[1] PDB101: Molecule of the Month: Collagen. https://pdb101.rcsb.org/motm/4 (accessed Oct 20, 2020).